

being in the strong acid E was negative to the weaker acids F and G; and iron in the medium acid F was negative to the same metal in G.

978. For the purpose of understanding more distinctly what the contact theory has to do here, I will illustrate the case by a diagram. Let fig. 74 represent a circle of metal and sulphuric acid. If A be an arc of iron or copper, and B C strong oil of vitriol, there will be no determinate current: or if B C be weak acid, there will be no such current: but let it be strong acid at B, and diluted at C, an electric current will run

Fig. 74. round A C B. If the metal A be

silver, it is equally indifferent with the strong and also with the weak acid, as iron has been found to be as to the production of a current; but, besides that, it is indifferent with the strong acid at B and the weak acid at C. Now if the dilution of the electrolyte at one part, as C, had so far increased the contact electromotive force there, when iron or copper was present, as to produce the current found by experiment; surely it ought (consistently with any reasonable limitations of the assumptions in the contact theory) to have produced the same effect with silver: but there was none. Making the metal A lead or tin, the difficulty becomes far greater; for though with the strong or the weak acid alone any effect of a determinate current is nothing, yet one occurs upon dilution at C, but now dilution must be supposed to *weaken* instead of *strengthen* the contact force, for the current is in the reverse direction.

979. Neither can these successive changes be referred to a gradual progression in the effect of dilution, dependent upon the *order of the metals*. For supposing dilution more favourable to the electromotive force of the contact of an acid and a metal, *in proportion* as the metals were in a certain order, as for instance that of their efficacy in the voltaic battery; though such an assumption might seem to account for the gradual diminution of effect from iron to copper, and from copper to silver, one would not expect the reverse effects, or those on the other side of zero, to appear by a return back to such metals as lead and tin (967, 977), but rather

look for them in platinum
or gold, which, however, produce no
results of the kind (964,
976). To increase still further this
complexity, it appears, from
what has been before stated, that on
changing the *acids* the